Iran. Econ. Rev. Vol. 22, No. 3, 2018. pp. 669-683

Oil, Government's Budget and Economic Growth: A Dynamic Panel Data Model for Selected Oil Exporting Economies

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Received: 2016, September 17 Accepted: 2017, October 21

Abstract

Recognition of economic growth determinants is one of the most important concerns for economists. In the oil exporting countries oil revenues play a significant role for the economy alongside with other economic growth determinants. This paper attempts to investigate the role of oil in selected oil-revenue dependent economies. Since oil revenue goes directly to public treasury and is expended by the government, government's management for this revenue would be crucial in the economy. This paper utilizes a proposed index, as Government Savings over Oil Revenues (GSOR). The higher level of GSOR suggests that governments finance their expenses by non-oil revenues more than oil revenues, which is a better situation. Findings from a Dynamic Panel Data model and GMM estimation method, on 12 oil exporting economies during 1990-2013, show that GSOR has significant positive effect on real GDP growth.

Keywords: Oil Exporting Economies, Government Expenses, Economic Growth, Dynamic Panel Data Model, GMM Method.

JEL Classification: H5, Q3, C3.

1. Introduction

It is More than four decades, from the first oil boom, that economists are looking for a reasonable explanation for the resource curse phenomenon in oil exporting countries. According to this phenomenon, natural-resource-rich countries, especially oil-rich ones, often are not able to use their resources to achieve economic development. Most of these countries waste their plenteous natural resource revenues, in a way that quantitative measures such as

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economic growth and income distribution have relative undesirable performance compared to countries that are poor in natural resources.

For instance, the per capita Gross Domestic Product (GDP) for Nigeria (an OPEC member) in 2000 was less than at independence in 1960. In 2013 its per capita GDP has reached only to a third of this variable in middle-income countries[1]. Nigeria is not alone. In Iran, per capita GDP in 1988 was a half of the value in 1976 and in 2013 it was still a bit less than the value in 1976[2]. For Venezuela, another oil-rich country, per capita GDP in 2003 was only 60 percent of the value in 1977 and in 2013 has climbed to only 90 percent of the value in 1977[3]. Average growth rate of per capita GDP in Nigeria during four decades since 1974 was only 0.9 percent. These rates for Iran and Venezuela were 0.8 and 0 percent respectively.

Having a look at the data of 36 countries that their oil exports during 1974-2013 averagely exceeds 20 percent of their merchandise exports, shows that the higher mentioned percentage, leads to lower economic growth (Figure 1).

This paper tries to investigate the effect of oil revenues on economic growth via a new aspect of the issue relative to government expenses and oil revenues. It focuses on the management of oil revenues in oil exporting countries. Since oil revenues go directly to public treasury and is expended by the government, it seems that government's management on these revenues would be a determinant for the economy. To evaluate this management, this paper uses a proposed index, as Government Savings over Oil Revenue (GSOR[4]). This index, substantially can show that, how oil revenue has been widely used to finance government expenses.

The paper examines GSOR's effect on economic growth, using a Dynamic Panel Data model on 12 selected oil exporting countries

1. Per capita GDP for Nigeria at 2005 constant prices in 1960, 2000 and 2013 was respectively 559,552 and 1055 US Dollar. Average of per capita GDP in middle-income countries at 2005 constant prices in 2013 was about 2826 US Dollar (World Bank, 2015, http://data.worldbank.org/country).
2. Per capita GDP for Iran at 2005 constant prices in 1976, 1988 and 2013 was respectively 3316, 1580 and 3131 US Dollar (Ibid).
3. Per capita GDP for Venezuela at 2005 constant prices in 1977, 2003 and 2013 was respectively 7138, 4322 and 6401 US Dollar (Ibid).
4. This indicator has been proposed for the first time in Eltejaei (2007).

during 1990-2013. Before presenting the model, we review the theoretical and experimental literature briefly.

Figure 1: Fuel Export as a Percent of Total Merchandise Exports vs. Growth Rate of GDP Per Capita in 36 oil exporting Countries

Note: Simple regression of per capita GDP growth rate on the share of oil exports over total exports shows that every one percent increase in recent variable leads to 0.02 percent decrease in economic growth. Of course, this is a simple regression without considering other determinants of economic growth; nonetheless it can be interpreted as a considerable negative dependence of economic growth to economic monoculture degree.

Source: Calculation based on data from World Bank, 2015, http://data.worldbank.org/country

2. A Brief Literature Review

Since the middle of twentieth century, numerous successes of new industrialized countries, like South East Asian economies, had a deep effect on ideas and theories about economic development and meanwhile, the role of government. These have supported the belief that government can play a basic role in economic growth and development through markets. Stiglitz (1996) believes that if there have been economies that reached considerable successes without giving a relatively important role to their governments, surely, their number would be very low. Also, recent economic depression that started in 2008 has shown the importance of state programming for recession control and reinforcement of institutional infrastructures of capitalist economies. However, what is undoubtedly acceptable is that

governments exist for economic, political and social reasons and are a very important phenomenon in contemporary economies.

The most important and prevalent mechanisms of government intervention in an economy, is through its revenues and expenditures, fiscal policies. Many studies have investigated the relationship between economic growth and government's revenues and expenditures. For instance, Tsaurai and Odhiambo (2013) accepting this relation, investigate the direction of causality between government expenditure and economic growth. In this regard, they introduce three views: Keynesian view, the Wagnerian theory, and the feedback view. The Keynesian view is of the opinion that causality runs from government expenditure to economic growth; whilst Wagner's theory argues that economic growth influences government expenditure. The feedback view states that both government expenditure and economic growth promote one another (Tsaurai and Odhiambo, 2013: 82).

Some studies, have investigated the relationship between economic growth and the composition of government expenditures as consumption and capital expenditures. Some have assessed the effects of capital expenses on economic growth as positive and some have recognized the effects as negative. A seminal study in this regard is Barro (1990). According to his, government expenditure on infrastructural development promotes private sector productivity. Bose et al. (2007) revealed that government capital expenditure is positively and significantly correlated with economic growth; whilst current expenditure was found to have an insignificant relationship with economic growth. According to Suruga and Le (2005) any government non-capital expenditure negatively influences economic growth. Schaltegger and Torgler (2006) found that government operating budget has a negative impact on economic growth and capital expenditure has an insignificant impact on economic growth.

In natural-resource-rich countries, especially oil-rich ones, where the government receives natural resource rents and revenues directly, the importance of government role is manifold. In these economies most of national output is derived from natural resource exports and it is the government that distributes the incomes to the whole economy. Therefore, policies can be more important and effective. Governments

can divert natural underground capital to other kinds of persistent capitals for all generations, or, by mismanagement peculate abundant revenues.

In brief, principle reasons for poor performance of natural-resource-rich countries can be mentioned as below:

Dutch Disease: Natural resource abundance often results in an abundance of foreign currencies that are not obtained by interaction between different sectors of the economy, but are gathered from raw-material exports. This naturally results in an overvaluation of the national currency and consequently, reduces the power of the industrial sector and exports of non-natural-resource goods and services. Likely, Dutch disease is the most introduced explanation for resource curse in many studies (for instance, Corden, 1984; Sachs and Warner, 1997; Gylfason, Herbertsson, and Zoega, 1999; Herbertsson, Skúladóttir, and Zoega, 1999).

Education and Human Capital: Nations that are confident that their natural resources are their most important asset may neglect the development of their human resources by devoting inadequate attention and expenditure to education. Their natural wealth may blind them to the need for educating their children (Gylfason, 2000:2).

Savings and Investment: Natural resource abundance may reduce both public and private sector incentives for savings and investment and so prevents economic growth (Gylfason, 2001).

Rent Seeking: Natural-resource-rich economies have a proclivity for rent-seeking behaviors. This skews resource allocation away from useful economic activities (Auty, 2001). Rent seeking may breed corruption in business and government, thereby distorting the allocation of resources and reducing both economic efficiency and social equity (Gylfason, 2000).

Economic Mismanagement: Amongst all empirical mechanisms which natural resources affect economies, it seems that the management of natural resource revenues, especially oily ones, is of utmost importance for economic growth in oil exporting countries. In most of these countries, oil revenues are state owned revenues, so, an important aspect of oil management is the management of government revenues derived from the hydrocarbon resources.

Sachs and warner (1997) believe that false economic policies are

implemented as a result of natural resource abundance. Again, Sachs and Warner (1999) point out that natural resource abundance may cause a false sense of security in the country and lead governments to lose sight of the need for well-advised economic management for development and growth, including free trade, bureaucratic efficiency, and institutional quality.

Eifert et al. (2002), state that the oil exporter countries can do better than they would have done without oil rents. However, the oil exporters' economic performance has, with few exceptions, been poor. They argue that the main factors determining the success of mineral exporters are less likely to be technical and more likely to relate to the political economy of managing rents.

Atkinson and Hamilton (2003), in a cross-country survey about resource curse theory, show that this theory represents oil government's disability to manage oil revenue accurately.

Eltejaei (2007, 2015) using a VAR approach has shown that financing government expenditures by non-oil revenue in Iran, has positive effects on economic growth.

3. Government Savings over Oil Revenue (GSOR) in Oil Dependent Economies

Twelve oil exporting countries have been selected for this study. The main measure for this selection is their fuel exports as a percentage of merchandise exports. In many countries fuel exports has a major position among merchandise exports, but only in twelve of them this indicator was above 50 percent averagely in the decade of 2005-2014. These are, Azerbaijan, Bahrain, Cameroon, Colombia, Congo (Republic), Iran, Kazakhstan, Kuwait, Nigeria, Oman, Russian Federation and Venezuela (Figure 2).

Oil revenues in these countries have played an important role in financing government expenses. As figure 2 shows, in most selected countries, non-tax revenues, which can be easily interpreted to oil revenues, form the major part of total government revenues. It means that in the mentioned countries financing government expenses are highly dependent on oil.

Figure 2: Oil Share in Exports and Government Revenues, Average 2005-2014.
Note: Based on available data, non-tax revenues as a percentage of total revenues for Kuwait and Cameroon are averages of 1990-1998 and for Kazakhstan is average of 1997-2001.
Source: Calculation based on data from World Bank, op cit.

In addition to two above indicators, another indicator as Government Savings over Oil Revenue (GSOR) can be hired to show dependency of financing government expenses on oil. Oil revenue forms the most important part of foreign currency earnings, but the predominant transmission mechanism of this revenue to the economy is through government's expenditures. We can refer to this mechanism as the management of oil revenues that undoubtedly is very important for economic performance in oil exporting countries.

GSOR is defined as below (Eltejaei, 2007; 2015):

$$GSOR = \frac{GOR + GNOR - GCE}{GOR} \times 100 \quad (1)$$

$$= (1 + \frac{GNOR - GCE}{GOR}) \times 100 \quad (2)$$

$$\begin{aligned} &\text{GSOR} = 100 \quad \text{if} \quad \text{GNOR} = \text{GCE} \\ &\text{GSOR} > 100 \quad \text{if} \quad \text{GNOR} > GCE \\ &\text{GSOR} < 100 \quad \text{if} \quad \text{GNOR} < GCE \end{aligned} \quad (3)$$

Where, GSOR is the indicator for government potential savings over its oil revenue, GOR is government's oil revenue, GNOR is government's non-oil revenue and GCE is government's consumption expenses. If we consider the government's consumption expenses[1] as its consumption, then the numerator in equation (1) gives us a measure for government's potential saving that can be allocated to capital expenditures.

The optimal situation would be if the dependence of total budget, both consumption and capital expenditures, on oil is cut. However, we suppose that the government should at least be able to cover its consumption costs through non-oil revenues. If government could do so, the oil revenues could be allocated to capital expenditures. These two cases mean that in the numerator of equation (2), GNOR is greater than or equal to GCE, then GSOR is greater than or equal to 100. But if the government is unable to finance its consumption expenses by non-oil sources, it means GNOR is less than GCE, the index will be less than 100. Hence, the state finance situation will be worse or in other words, government budget will be more dependent on oil resources, if GSOR is less than 100. Vice versa, whenever the indicator increases and is closed to 100, it will lead more favorable conditions.

Figure 3 shows average GSOR indicator for selected countries during 1990-2013. In all except one country this indicator was less than 100 averagely.

Figure 4 shows how GSOR is scattered against growth rate of Real Gross Domestic Product (designated as GDPGR) in selected countries during 1990-2013. Obviously a positive significant correlation is seen between these two variables. A more precise relationship between GSOR and real GDP growth is investigated in the next section.

1. That is total expenditures minus capital expenditures.

Figure 3: GSOR, Average 1990-2013
Source: Calculation based on data from World sBank, op cit.

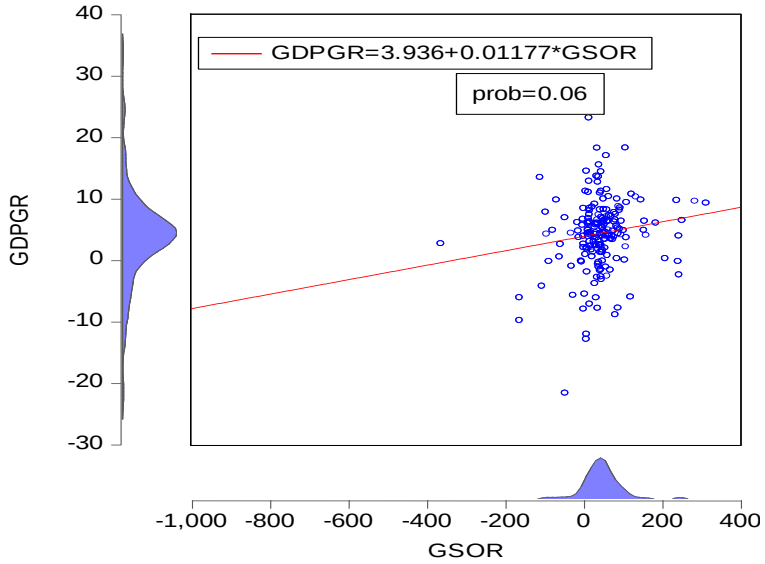

Figure 4: Scatter Diagram of GSOR and GDPGR, 1990-2013.
Source: Calculation based on data from World Bank, op cit.

4. Dynamic Panel Data Approach

To evaluate the effect of GSOR on economic growth in selected oil exporting countries, a Dynamic Panel Data Model is used. Based on available data during 1990-2013, selected countries are the countries

shown in figures 2 and 3. The specified Model is:

$$gdpgr_{it} = \alpha gdpgr_{it-1} + \beta gsor_{it} + \delta' X_{it} + \mu_i + \varepsilon_{it}$$

Where μ_i indicates effects of crosses. Also, X_{it} defines control variables. In experimental studies on economic growth, many variables are used as determinants of economic growth. Now, based on literature, available data and diagnostic tests, X_s are Inflation (INF), Gross Capital Formation as a percentage of GDP (GCF) Terms of Trade (TT) and first lag of the logarithm of GDP ($lngdp_{t-1}$) as a measure for initial national income. Source of raw data is the World Bank.

Before estimating the model, data stationarity is tested. Results of unit root tests are shown in Table 1.

Table 1: Unit Root Tests

Variables	Levin, Lin & Chu t*	Im, Pesaran and Shin W-stat	ADF - Fisher Chi-square	PP - Fisher Chi-square	Decision
GSOR	-3.39	-1.90	35.15	41.28	stationary
	(0.000)	(0.028)	(0.037)	(0.016)	
GDPGR	-7.97	-9.35	143.60	177.10	stationary
	(0.000)	(0.000)	(0.000)	(0.000)	
INF	-5.75	-6.27	89.40	593.50	stationary
	(0.000)	(0.000)	(0.000)	(0.000)	
GCF	-5.6	-4.8	73.9	43.4	stationary
	(0.000)	(0.000)	(0.000)	(0.001)	
TT	-3.45	-1.1	31.3	37.5	stationary
	(0.000)	(0.091)	(0.089)	(0.038)	

Note: Numbers in parentheses are P-Values.
Source: Author's Calculation

Arellano and Bond (1991) show that when the lag of dependent variable is appeared on the right hand of the specified equation as determinant variable, Ordinary Least Square (OLS) method is not consistent anymore. In this case, they suggest a Generalized Method of Moments (GMM) estimator and propose a Sargan-type test for over-identifying restrictions[1].

1. See Baltaji (2005).

Table 2 shows the results of model estimation using Arellano and Bond's estimation method. As the results show, GSOR as the main independent variable has significant positive effect on real GDP growth in all specified models. In other words, the higher GSOR leads to higher economic growth. This finding approves above analysis about the importance of this index as a determinant for economic growth in oil exporting countries.

All estimations of control variables have expected signs and almost all of them are significant. Lag of GDP growth has positive significant (except for model 6) effect on GDP growth. It seems that as the number of independent variables increases, the significance level (P-Value) of this estimator is increased too. Variable $lngdp_{t-1}$ as the measure of initial national income has negative significant effect on economic growth that implies convergence. Inflation has negative effect on economic growth that maybe is a result of high rates of inflation in some of these countries; however this estimation is not significant. Two last variables, Gross Capital Formation as a

Table 2: Estimation Results

	Model Specifications				
Variables	**(1)**	**(2)**	**(3)**	**(5)**	**(6)**
$GDPGR_{t-1}$	0.17 ** (0.02)	0.14 ** (0.04)	0.14 ** (0.049)	0.11 * (0.09)	0.45 (0.6)
GSOR	0.014 ** (0.03)	0.015 ** (0.02)	0.015 ** (0.02)	0.014 ** (0.04)	0.012 * (0.09)
$Ln(GDP_{t-1})$		-6.19 *** (0.001)	-5.9 *** (0.005)	-8.2 *** (0.000)	-19.3 *** (0.000)
INF			-0.05 (0.2)		
GCF				0.2 *** (0.009)	0.11 (0.20)
TT					0.06 *** (0.001)
N	143	143	130	143	105
Sargan Test	129.15 (0.37)	135.8 (0.23)	128.1 (0.26)	134.1 (0.24)	95.7 (0.6)

Note: ***, ** and * correspondingly indicate the significance level of the coefficient at 1%, 5% and 10%.
Numbers in parentheses are P-Values.
Source: Author's Calculation

percentage of GDP and Terms of Trade, also have positive significant (except for GCF in model 6) effects on economic growth that are expected findings.

5. Conclusion

This paper examined one important determinant of economic growth in oil exporting economies. Available evidences suggest that the oil sector has profoundly influenced these economies in many ways. Oil exports comprises between 55 to 95 percent of total exports, and a great part of government revenues in the general budget.

Since oil revenue goes directly to public treasury and is expended by the government, government's good management on this revenue would be crucial in the economy. This paper proposed a new index, to evaluate role of oil in oil exporting economies as Government Savings over Oil Revenues (GSO R). The higher level of GSOR suggests that the governments finance their expenses by non-oil revenues more than oil revenues, which is a better situation. Based on the proposed index, the economic situation of these countries has been very critical over the past two decades.

Also, findings from a Dynamic Panel Data model and Arellano and Bond's (1991) GMM estimation method, on 12 oil exporting economies during 1990-2013, show that GSOR has significant positive effect on real GDP growth. Based on this result, an important way to accelerate economic growth in oil export-dependent countries is to increase GSOR. Policy implication of this finding is that, governments in oil exporting countries should avoid financing their consumption expenditures by oil revenues. Anyhow, oil is an underground physical capital and should be converted to another kind of accessible capitals.

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